

The *Tempérament Ordinaire*

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During the baroque period a mathematical and musical battle was smoldering across Western Europe. Dozens of competing temperaments were being conceived and advocated throughout the larger musical community. The primary goal of these temperaments was achieving what is now known as *circularity*; the idea that on a fixed-pitch instrument such as the harpsichord, the specifics of a given temperament allowed all basic tonalities of the Western harmonic system to be used without having to adjust the tuning of any individual notes. The ultimate victor in the temperament war was the uniform *equal temperament*, which dominates Western music to this very day. There was, however, one country which resisted the shift towards equality much longer than others, resulting in temperaments with unique characteristics particularly suited to their repertoire and aesthetic. The most prolific of these unusual temperaments was that used in France during the second half of the baroque, the ubiquitous *tempérament ordinaire*. Examining the background of the *ordinaire*, as well as its harmonic and tonal ramifications for French keyboard music, makes it readily seen as an important development in the history of Western music.

Tracing the roots of the *ordinaire* requires, first, a larger step back to the basis of temperaments in Western music. A temperament is defined as how the notes within an octave are spaced relative to one another in a fixed-pitch system, such as those used on harpsichords, lutes, and organs.¹ All popular temperaments utilized for fixed-pitch instruments in Western Europe were formed from either an adaptation of the Pythagorean, or later, the meantone system.² In Western music, the octave—the simplest consonant interval with a frequency ratio of 2:1—was originally divided into seven diatonic tones—A, B, C, D, E, F, and G—based on simple

¹ Mark Lindley, "Temperaments," *Grove Music Online, Oxford Music Online*, Oxford University Press, accessed April 4, 2016, <http://www.oxfordmusiconline.com.ezproxy.usd.edu/subscriber/article/grove/music/27643>.

² Claudio Di Veroli, *Unequal Temperaments: Theory, History, and Practice* (Bray: Claudio Di Veroli, 2013), 116.

mathematical ratios. This scalar construction can be traced back directly to the works of Pythagoras, who first established the properties of consonant ratios using a monochord.³ Eventually the chromatic notes were added in between the diatonic ones, which allowed composers to use various modes in different transpositions and explore some degree of chromaticism. When tuning a fixed pitch instrument to the Pythagorean scale, the temperament was set by tuning a consecutive series of pure fifths and fourths through the entire circle of twelve diatonic and chromatic tones.⁴

This process resulted in two glaring shortcomings that had to be rectified. First, it rendered major thirds which were far wider than pure (408 cents as opposed to 386 cents).⁵ This was of no real consequence at the time, as major thirds were rarely found in music, and they were considered dissonant when present. More importantly, the ratio of the pure fifth—3:2—never factored equally into the ratio of the octave—2:1. After tuning a series of pure fifths from note ‘X’, passing through the chromatic notes as well as the diatonic ones, the same note X a number of octaves higher would be significantly out of tune. This discrepancy came to be known as the *Pythagorean comma*.⁶ Some manner of compromise was required if a fixed-pitch instrument was to be tuned by this method and still be usable. The compromise was found in the implementation of a *wolf fifth*, located in the enharmonically equivalent interval between the chromatic G# and Eb.⁷ Named for its ‘howling’ quality, the enharmonic discrepancy rendered

³ André Barbera, “Pythagoras,” *Grove Music Online, Oxford Music Online*, Oxford University Press, accessed April 1, 2016, <http://www.oxfordmusiconline.com.ezproxy.usd.edu/subscriber/article/grove/music/2260>

⁴ Claudio Di Veroli, *Unequal Temperaments*, 30.

⁵ A cent is a measure of musical intervals defined as 1/100th of an equal tempered semitone.

⁶ Claudio Di Veroli, *Unequal Temperaments*, 31.

⁷ This enharmonic equivalence is actually of immediate importance: the gross mistuning of the wolf ‘fifth’ is a direct result of it actually being a Pythagorean diminished sixth. The wolf can be shifted by retuning through the circle to any desired enharmonic placement, i.e., F#-Db, A-Fb, etc.

one fifth out of the complete circle that was far narrower than pure, allowing the circle to be closed and adhere to Pythagorean tuning in all but one segment.⁸

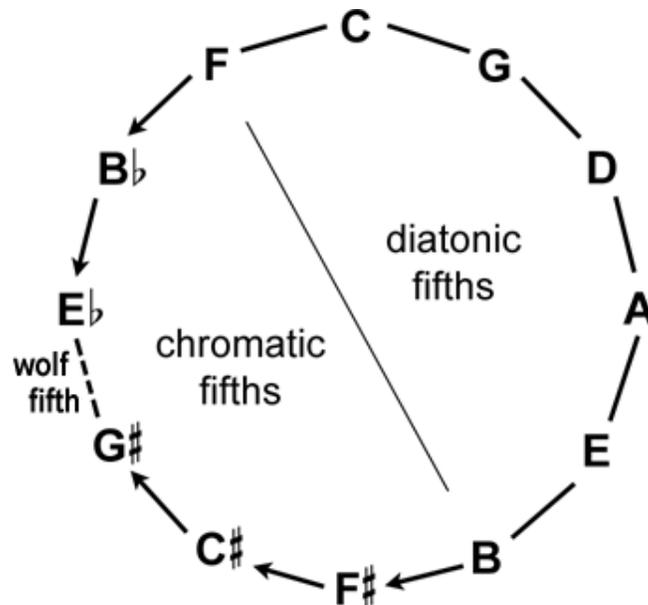


Figure 1. Pythagorean circle of fifths illustrating diatonic and chromatic fifths, and the enharmonic ‘wolf’. *Source: Claudio Di Veroli, Unequal Temperaments, 30.*

The use of thirds and sixths entered Western polyphony through the *contenance angloise* and pan-consonant style of fifteenth-century composers such as John Dunstable and William Byrd.⁹ The introduction of the major third as a central (and consonant) interval quickly rendered the previously-dominant Pythagorean tuning system, with its very wide, harshly-beating major thirds, less than ideal.¹⁰ At this point, the tranquil sound of a beatless, pure major third began to overtake the importance of the pure fifths and fourths that were implicit in early open harmony

⁸ Guy Oldham and Mark Lindley, “Wolf,” *Grove Music Online, Oxford Music Online*, Oxford University Press, accessed April 1, 2016, <http://www.oxfordmusiconline.com.ezproxy.usd.edu/subscriber/article/grove/music/30489>.

⁹ Margaret Bent, “Dunstaple, John,” *Grove Music Online, Oxford Music Online*, Oxford University Press, accessed April 2, 2016, <http://www.oxfordmusiconline.com.ezproxy.usd.edu/subscriber/article/grove/music/08331>.

¹⁰ Beats within an interval are caused by any deviation in the two tones from the simple ratio of the equivalent pure interval. The further from pure, the faster and more noticeably an interval will aurally beat.

Edward Kottick, *The Harpsichord Owner’s Guide* (Charlotte: UNC Press, 1987), 152.

and the Pythagorean system.¹¹ A new compromise was required, which resulted in the formation of the second most important temperament family in Western music history: meantone and its variants.

In a meantone temperament, tuning was no longer based off a circle of pure fifths, as this was already demonstrated to produce major thirds far from the pure ideal. Instead of cramming the Pythagorean comma into one narrow fifth from the chain of twelve, meantone temperament was derived from an adaptation of *just intonation*, which was altered through the equal distribution of a previously undiscussed element, the *syntonic comma*.¹² The syntonic comma was discovered as the difference between the result of stacking four pure fifths, and the result of stacking two pure octaves plus a pure major third.¹³ In meantone temperaments, the syntonic comma was distributed through the chain of fifths, resulting in eleven fifths tempered narrow and one remnant wide wolf, still at the G#-Eb location in the circle.¹⁴ This practice resulted in the temperament known as $\frac{1}{4}$ *syntonic comma (s.c.) meantone*; each fifth being tempered narrow by one quarter of the syntonic comma.

The immediate benefit of tempering the fifths was that pure major thirds were available through a majority of the circle, something that was never possible in a Pythagorean derived temperament.¹⁵ A number of distant chromatic keys such as C#, Ab, F#, and B were unusable—

¹¹ Ross Duffin, *How Equal Temperament Ruined Harmony, and why you should care* (New York: W. W. Norton & Co., 2007), 32–34.

¹² Just Intonation, in which all intervals and triads are pure, is only possible on non-fixed-pitch instruments, such as the voice, unfretted strings, and the trombone.

Mark Lindley, “Temperaments,” *Grove Music Online, Oxford Music Online*, Oxford University Press, accessed April 1, 2016, <http://www.oxfordmusiconline.com.ezproxy.usd.edu/subscriber/article/grove/music/27643>.

¹³ Claudio Di Veroli, *Unequal Temperaments*, 48–50.

¹⁴ Martin Tittle, *A Performers Guide Through Historical Keyboard Temperaments* (Ann Arbor: Anderson Press, 1987), 30–31.

¹⁵ As demonstrated previously, the pure fifths and fourths of Pythagorean intonation immediately dismissed the existence of pure thirds.

due to newly introduced wide wolf thirds, themselves a byproduct of the distribution of the syntonic comma—in all but the most briefly passing instances. Like the major thirds in Gothic polyphony, use of these tonalities was rare at the time and the meantone system yielded vast improvement over the Pythagorean alternative in the central diatonic keys such as C, F, G, D, and A.¹⁶ Even though most of the fifths had an audible mistuning at around two beats per second, the sheer stability of the pure major thirds was sufficient compensation, leaving the fifths scantily offensive.¹⁷ This benefit, coupled with Western music’s continual shift towards triadic harmony, carried meantone forward as the preferred temperament family from its original implementation around 1500 until the first half of the baroque period.¹⁸

The genesis and divergence of the French *tempérament ordinaire* can be traced directly to the theoretical works of Marin Mersenne, a French philosopher who was succinctly referred to as “the center of the world of science and mathematics during the first half of the 1600s.”¹⁹ In his *L’Harmonie Universelle* (1637), Mersenne discussed a deviation of the standard meantone temperament in which the enharmonic error previously concentrated in the wolf fifth, G#-Eb, was shared among the consecutive fifths, G#-Eb-Bb-F.²⁰ This distribution, known as *wolf trisection*, preserved the original standard meantone realization to a high degree but also slightly

¹⁶ Ann Bond, *A Guide to the Harpsichord* (Portland: Amadeus Press, 1997), 224–225.

Martin Tittle, *A Performers Guide*, 15.

¹⁷ Ann Bond, *A Guide to the Harpsichord*, 225.

¹⁸ Claudio Di Veroli, *Unequal Temperaments*, 60.

Martin Tittle, *A Performers Guide*, 14-15.

John Link, “Understanding the Two Great Temperaments: Equal and Meantone,” *Journal of Research in Music Education* 13, no 3 (1965): 138–139.

¹⁹ Peter Bernstein, *Against the Gods: The Remarkable Story of Risk* (New York: John Wiley & Sons, 1996), 59.

²⁰ Claudio Di Veroli, *Unequal Temperaments*, 103.

expanded the playability of distant tonalities, facilitating increased modulation and chromatics.²¹ It also introduced a new strata of key-color variation to the meantone system. In $\frac{1}{4}$ s.c. meantone there were only two sizes of major thirds—pure, or unusable wolves that were 41.1 cents (nearly a quarter-tone) wide.²² In Mersenne's scheme, there were five sizes of major thirds—pure, 10.4 cents wide, 20.3 cents wide, 30.7 cents wide, and 41.1 cents wide.²³ This level of variation was a welcomed affect in the baroque effort to explore the qualia of various harmonic and tonal centers. Use of the type of temperament described by Mersenne lasted for decades, as evidenced in Lambert Chaumont's critical 1695 work, *Pièces d'orgue*.²⁴ Mersenne's temperament, or some immediate variation thereof, was the assumed standard of all French composers at the end of the seventeenth century. Its familiarity to contemporary practitioners such as Louis Couperin and Jean-Baptiste Lully was corroborated by Jean Denis' mention of Mersenne's scheme as the 'familiar harmonic tuning' of France in his own treatise on harpsichord tuning.²⁵

Other countries with widespread use of the harpsichord developed—around the same time that Mersenne and his contemporaries began the practice of wolf trisection—alternative methods of working past the chromatic limitations of standard $\frac{1}{4}$ s.c. meantone. The most obvious way, albeit less than practical, of dealing with the various wolves in meantone was the implementation of enharmonic keyboards. On enharmonic keyboards, the accidentals used split-keys to allow both notes—D# and Eb, for example—to be played in their correct tuning.²⁶

²¹ This harmonic expansion depends on the resultant fifths Eb-Bb-F being tempered *wide*, something previously unseen in any temperament scheme, otherwise the wolf trisection results in what is essentially $\frac{1}{4}$ s.c. meantone, shifted marginally around the circle of fifths.

²² Claudio Di Veroli, *Unequal Temperaments*, 103.

²³ *Ibid.*

²⁴ *Ibid.*

²⁵ Vincent J. Panetta, *Treatise on Harpsichord Tuning by Jean Denis* (Cambridge: Cambridge University Press, 1987), 14–15.

²⁶ Vincent J. Panetta, *Treatise on Harpsichord Tuning*, 67–69.

Enharmonic keyboards were especially prevalent in Italy, where standard $\frac{1}{4}$ s.c. meantone was judiciously used, but almost non-existent in France.²⁷ Some musicians explored altering meantone through tempering the fifths by amounts other than $\frac{1}{4}$ s.c. This created temperaments that shared Mersenne's quality of expanding the compass of modulation, but no true *regular* meantone could ever eliminate the wolf fifth and also retain any pure thirds.²⁸ There were $\frac{1}{3}$ s.c., $\frac{1}{5}$ s.c., $\frac{1}{6}$ s.c. and even $\frac{2}{7}$ s.c. meantone variants during the baroque period.²⁹ These alternatives were more common throughout the continent than enharmonic keyboards, but they lacked the ability to expand circularity much beyond the limitations of $\frac{1}{4}$ s.c. meantone. At the same time that harpsichord builders were using physical methods to bypass the inherent lack of circularity in $\frac{1}{4}$ s.c. meantone and other variants, both German and Italian theorists began shifting temperament towards a very different end-result, creating a new class altogether known as the *good temperaments*.

The good temperaments, unlike the meantone systems that descended from just intonation, were derived from previously abandoned Pythagorean systems of the early

²⁷ It is unclear whether the lack of enharmonic keyboards stimulated the adaptation of Mersenne's temperament, or if French composers felt that Mersenne's adaptation eliminated the need for enharmonic keyboards, but the lack of their existence in seventeenth century France makes a clear implication: composers of French music did not seek to absolutely minimize key-color variation in the same way that German and Italian composers did.

Claudio Di Veroli, *Unequal Temperaments*, 67.

Denzil Wraight, *Complete list of surviving Italian string keyboard instruments originally provided with more than 12 notes per octave*, February 15, 2016. Accessed April 3, 2016
<http://www.denzilwraight.com/ChecklistSplitSharps.pdf>

Vincent J. Panetta, *Treatise on Harpsichord Tuning*, 42–43.

²⁸ Regularity is one descriptive measure of how intervals within a temperament are treated. If all fifths are tempered by the same amount (with the exception of the wolf) then a temperament is said to be regular. If there are fifths of different sizes spread through the temperament, it is irregular. Equal temperament, being equally tempered at all intervals, is both fully circular and fully regular.

²⁹ Claudio Di Veroli, *Unequal Temperaments*, 79–81.

Renaissance.³⁰ The purity of the major thirds in standard $\frac{1}{4}$ s.c. meantone was abandoned in favor of increasing circularity by way of decreasing regularity. The first prominent endorsement of a fully circular temperament came from Andreas Werckmeister in 1691.³¹ The specifics of Werckmeister's most popular temperament (Werckmeister III) immediately set it in the Pythagorean category: there were eight pure fifths, the remaining four tempered narrow by one quarter of the Pythagorean comma each. There were no pure major thirds present, and no wolves at any location in the circle.³² From this point, there was no turning back. With the pure thirds entirely eliminated, the meantone quality was lost, and the good temperaments began drifting continually closer to the regularity of equal temperament. Bach's *Well Tempered Clavier* (1722), presenting preludes and fugues in all 24 major and minor keys, was a direct testament to the fact that leading composers had adopted, embraced, and emphatically expected the use of fully-circular good temperaments by the early eighteenth century. Written evidence that the French were using something more advanced or circular than Mersenne's meantone temperament did not appear until later that decade.

In 1726, music theorist Jean-Philippe Rameau published his cornerstone work *Nouveau système de musique théorique*, which contained an account of a French temperament that bridged the gap between Mersenne's system (as recalled by Chaumont) and the burgeoning *tempérament ordinaire*.³³ Rameau discussed expanding the wolf distribution to a total of five fifths, yielding a

³⁰ Equal temperament, although having no pure open intervals as characteristic of Pythagorean tuning, is still in fact the ultimate result of the efforts to regularize the Pythagorean temperament. Equal temperament can also be correctly called $\frac{1}{12}$ p.c. tuning, because each note of the scale is tempered by $\frac{1}{12}$ of the Pythagorean comma, resulting in even distribution across the octave and entirely proportionate intervals from any given tone.

³¹ Rudolf Rasch, ed., *Musicalische Temperatur*, (Diapason Press, 1983), 26.

³² Martin Tittle, *A Performers Guide*, 14–15.

³³ Rameau, d'Alembert, and later, J. Rousseau, all commented that this version of the primitive ordinaire had been used back to much earlier times, possibly as early as the mid-Seventeenth century. A surviving fretted French clavichord ca. 1700 has shown to be arranged in a temperament matching that described by Rameau, placing his temperament as extant at the turn of the eighteenth century.

temperament that followed standard $\frac{1}{4}$ s.c. meantone for half the circle of fifths, leaving four pure thirds, but coming even closer to circularity than Mersenne. Two wolf thirds remained, preventing playability in all tonalities, but the compass of available modulations was vastly expanded beyond that of Mersenne's temperament while still preserving the same chordal quality and pure thirds of meantone in the central diatonic keys. Rameau addressed the remnant wolves in his tuning by dismissing them as affectively expressive tools, too infrequently used in harmony to worry about.³⁴ Within decades, Rameau's system was further adapted and became the true *tempérament ordinaire*; the French temperament that held out against regularity as late as the nineteenth century.

The most relevant work on the *ordinaire*; that which established it fully as the de facto preference of French music and cemented its place in the historical record, came about mid-century from French theorist Jean-le-Rond d'Alembert. D'Alembert reproduced a temperament in his *Elémens de musique théorique et pratique suivant les principes de M. Rameau* (1752) that credited Rameau as the originator of scheme, but accounted for changes that had been introduced over time.³⁵

In d'Alembert's temperament, meantone quality was preserved through half the circle of fifths, with the wolf spread among the remaining six fifths (three wide and three pure), resulting

Graham Sadler and Thomas Christensen, "Rameau, Jean-Philippe," *Grove Music Online, Oxford Music Online*, Oxford University Press, accessed April 3, 2016, <http://www.oxfordmusiconline.com.ezproxy.usd.edu/subscriber/article/grove/music/22832>.

Claudio Di Veroli, *Unequal Temperaments*, 420–421.

³⁴ Mark Lindley, "Innovations in Temperament and Harmony in French harpsichord music," *Early Music* 41, no 3 (August 2013): 408.

Claudio Di Veroli, *Unequal Temperaments*, 421.

³⁵ Thomas Christensen, "Alembert, Jean le Rond d'," *Grove Music Online, Oxford Music Online*, Oxford University Press, accessed April 3, 2016, <http://www.oxfordmusiconline.com.ezproxy.usd.edu/subscriber/article/grove/music/07068>.

in a varied distribution of thirds ranging from pure to harsh, but entirely usable.³⁶ This small difference implicated d'Alembert's record as a wholly important milestone in the French temperaments, as it was the first written proof that meantone-derived temperaments were made fully circular in late-baroque France. This circular temperament, as descended from the works of Mersenne and Rameau, was the colloquial French *tempérament ordinaire*: the only circular temperament known to have been used in Western music history that was not clearly a result of a Pythagorean system. In short, it was the culmination of a series of transitions in which French preferences created a temperament that was entirely contrary to those developed elsewhere in Europe, especially in the final decades before the onset of the Classical period.

Looking at the *ordinaire*'s place in the larger European timeline, contemporary accounts and endorsements show that temperaments in late-baroque Germany, Italy, and most other affiliated countries were similar to, if not identical, to those devised by the Italian Francesco Vallotti. Vallotti's temperaments refined the general scheme of Werckmeister by smoothing out the fifths and thirds, tucking away the most offending intervals in the distant keys, and drawing slightly closer to regularity.³⁷ Vallotti's temperament also exhibited an ingenuous symmetry in tonal quality on both sides of the circle of fifths, having diatonic and chromatic keys that deviated from purity by the same relative amounts in opposite directions.³⁸ It had six pure fifths, six hardly-tempered fifths, and thirds that varied from six to twenty-two cents wide. The key

³⁶ Di Veroli, *Unequal Temperaments*, 423–25.

³⁷ The fact that Vallotti, an Italian composer working under Italian patronage in a large Italian city-center, was refining and advocating a derivative of the good temperaments introduced earlier in Germany serves as further evidence of the isolation in which the French *ordinaire* developed.

Ann Bond, *A Guide to the Harpsichord*, 227.

Di Veroli, *Unequal Temperaments*, 123–126.

³⁸ *Ibid.*

differences between Vallotti's good temperament and d'Alembert's *temperament ordinaire* are easily seen when compared side-by-side:

	<i>Ordinaire</i>	Vallotti
Pure Fifths	3	6
Pure Thirds	3	0
Wide Fifths	3	0
Narrow Fifths	6	6
Wolf Intervals	0	0
Meantone Triads	4	0
Nearly-Just Triads	1	0

Figure 2. Interval width comparisons of Vallotti's good temperament and d'Alembert's *ordinaire*. Source: Data from Di Veroli, *Unequal Temperaments*, 123, 424.

Both the good temperaments and the French temperaments arrived at the same general result—a circular temperament that permitted a single piece of music to utilize all twelve tonalities if so desired. The good temperaments, however, did this in a way (by virtue of their Pythagorean origins) that presented a much lower overall variation in key-color. In Vallotti's temperament, the most representative example of a late-baroque good temperament, there were only two sizes of fifths: pure, and narrow. The narrow fifths in Vallotti were only half as tempered as the six meantone fifths present in the *ordinaire*. The meantone fifths, combined with the unusual three wide fifths in the *ordinaire*, left three keys in which a pure major third existed in the tonic triad.³⁹ In either system, the concept of enharmonic sharps and naturals was

³⁹ Interestingly, the *ordinaire* results in one triad that is nearly-just—F-A-C—with a pure fifth and minimally tempered third. This is the only time a nearly-just triad is found in a circular temperament, save for a few peculiar multiple-manual split-key instruments that facilitated—by dividing the octave into 30 or more notes—nearly circular just intonation. The sheer complexity in the manufacture and playing of these instruments made them scarcely more than curiosities.

Wide fifths were almost certainly not a part of any harpsichord temperament used by the leading German and Italian schools, as evidenced by J.S. and C.P.E Bach's failure to ever mention anything other than fifths tempered narrow.

eliminated altogether.⁴⁰ The single feature shared by the French and Italian circular temperaments was the presence of six narrow fifths. The large difference in key-color and interval qualities between the two types of circular temperaments, outside of their respective lineages, is what truly set them apart and established harmonic implications in the compositions of their respective endorsers.

The good temperaments used by prominent composers such as Bach and Handel enabled music to be written in any major or minor key with only minimal variation in the harmonic quality. The largest difference in quality was only about fifteen cents between the best and worst thirds, and four cents between the best and worst fifths.⁴¹ This meant that any key was able to be the central tonality of a piece, any other key was reachable by modulation with minimal shift in affectual quality, and any related key was available to close a work given proper harmonic structure. This was very much not the case in the *ordinaire*.

In the *ordinaire*, major thirds varied from pure to 30.1 cents wide, and fifths varied from 5.4 cents narrow to 4.4 cents wide, a cumulative variation of over twice that present in Vallotti.⁴² Unless the composer intentionally sought a restless, inconclusive, or otherwise tense quality, the heightened cumulative instability left a number of the chromatic keys were ill-suited as central tonalities in the *ordinaire*.⁴³ If, for example, a piece started in Bb major, the dominant F triad was significantly more stable (both mathematically and aurally) than the tonic, resulting in a

John O'Donnell, "Bach's Temperament, Occam's Razor, and the Neidhardt Factor," *Early Music* 34, no 4 (2006): 626.

⁴⁰ This is a mandatory qualification for a temperament to be truly circular with only twelve notes available on the keyboard.

⁴¹ Claudio Di Veroli, *Unequal Temperaments*, 123.

⁴² *Ibid.*, 109–110.

⁴³ Ann Bond, *A Guide to the Harpsichord*, 227–28.

Mark Lindley, "Temperaments"

harmonic disconnect between the inherent gravity of the V-I progression and the qualities of the temperament.⁴⁴ The effect was even more pronounced in Eb major, where both the dominant Bb and subdominant F triads had over twice the cumulative stability as the tonic. A chromatic modulation from C to C# demanded a drastic shift from a tonic with a pure major third to one with a third 30.1 cents wide. All of these idiosyncrasies derived from the fact that the French temperament preserved as many qualities of standard ¼ s.c. meantone as possible, compromising in the smallest manner possible to achieve circularity with no wolves.

Major Triad	C	C#	D	Eb	E	F	F#	G	Ab	A	Bb	B
Cumulative Instability (cents)	5.4	30.3	5.4	27.1	16.2	5.4	28.1	5.4	32.5	10.8	15.2	23.7
Major Triad	F	C	G	D	A	Bb	E	B	Eb	F#	C#	Ab
Cumulative Instability (cents)	5.4	5.4	5.4	5.4	10.8	15.2	16.2	23.7	27.1	28.1	30.3	32.5

Figure 3. Cumulative instability of diatonic and chromatic major triads in the temperament ordinaire, arranged first chromatically and then by order of decreasing stability. *Source*: Data from Claudio Di Veroli, *Unequal Temperaments*, 109.

This allegiance to the harmonically alluring sound of the pure major thirds created a temperament that—while useable in all twelve tonalities—strongly favored the central diatonic keys over the chromatic keys with compromised triads.⁴⁵ In the music of other regions this

⁴⁴ The difference in stability of relative major triads can be observed by comparing their *cumulative instability*, the total aggregate deviation from purity of both the third and fifth.

⁴⁵ Mark Lindley, “Innovations in Temperament”: 410–411.

variation presented a potential hindrance to harmonic development and chromatic exploration.⁴⁶

The French, however, embraced the variance as an inherent aid to the contrasting quality of the baroque style.⁴⁷

The keyboard works of *les grandes maîtres* (grand masters) of French keyboard music, Francois Couperin and Rameau, as well as their close contemporary Jean d'Anglebert, were all composed with one of the meantone-based French temperaments in mind, and likely performed in the *ordinaire* in the mid-eighteenth century.⁴⁸ The total harmonic compass of their repertoire fell, by no mere coincidence, in a range that corresponds to the affectual variation of *ordinaire*, with consonant major sonorities centralized within the diatonic keys, and dissonances of distant

⁴⁶ It is worth noting here that the *ordinaire* is largely a limiting temperament, having greater restrictions on suitable repertoire and application than any of the other late-Baroque circular temperaments. Something that sounds good in the *ordinaire* will always sound good in a more regular circular temperament such as Werckmeister or Vallotti. The opposite, however, is not true. The increased regularity of German and Italian circular temperaments can tame a lot of the chromatic or distant modulations that would sound much more abrasive in the *ordinaire*. It follows that a piece of music, though consonant in a more regular circular temperament, could sound woefully dissonant in the *ordinaire* if its tonalities do not follow the hierarchy of cumulative instability. In this light, the only practical use of the *ordinaire* is for an instrument, or specific event, where only appropriate French repertoire—or earlier repertoire that was originally intended for a meantone derivative—that melds with the *ordinaire*'s characteristics will be played.

There is of course, always some degree of key-color variation in an irregular temperament, and this was utilized to some extent by all Baroque composers, but the characteristics of the *ordinaire* allowed this variation to be further employed in musical settings.

James Young, "Key, Temperament and Musical Expression," *The Journal of Aesthetics and Art Criticism* 49, no 3 (1991): 235–42. doi:10.2307/431477.

Mark Lindley, "Well-tempered clavier," *Grove Music Online, Oxford Music Online*, Oxford University Press, accessed April 4, 2016, <http://www.oxfordmusiconline.com.ezproxy.usd.edu/subscriber/article/grove/music/30099>.

⁴⁷ Claude V. Palisca, "Baroque," *Grove Music Online, Oxford Music Online*, Oxford University Press, accessed April 3, 2016, <http://www.oxfordmusiconline.com.ezproxy.usd.edu/subscriber/article/grove/music/0209>.

In addition to the variances in key-color, the French were also pioneers in using multiple manuals, registrations, and stops to produce varying timbres that were utilized in harpsichord composition.

Edwin M. Ripin, et al, "Harpsichord," *Grove Music Online, Oxford Music Online*, Oxford University Press, accessed April 5, 2016, <http://www.oxfordmusiconline.com.ezproxy.usd.edu/subscriber/article/grove/music/12420pg4>.

⁴⁸ Mark Lindley, "Authentic Instruments, Authentic Playing," *The Musical Times* 118 (1977): 285.

keys embraced as colorful developments.⁴⁹ D'Anglebert's *Pieces de Clavecin* consisted only of works in D and G major and minor. The most harmonically adventurous triad used, and only a handful of times, was B major as a V/V half-cadence in the "Troisième Courante". In this instance, the relative instability of the 20.3 cent wide B-D# major third assisted in the harmonic pull towards the resolute E major triad, which was of standard meantone disposition.⁵⁰ The rest of the work rested entirely in the harmonic realm of the meantone diatonic triads.⁵¹

Rameau's works had a slightly larger spread of central tonalities, reaching out occasionally as far as four sharps and three flats, but still existed almost entirely in the diatonic meantone keys. Distant harmonies such as B major and F# major are scattered throughout, but again are used only when their harmonic function results in a directed resolution back to one of the meantone centers. In his "Deuxieme Gigue en Rondeau" in E major, F# was used in another V/V progression, creating a cascading effect of triads leading back to E not only in the harmonic sense, but also in respect to the stability of the thirds in their respective triads. A passage in the middle of "Le Rappel des Oiseaux" (E minor) transitioned chromatically

⁴⁹ The music of Rameau features heavily in chromatic dissonance, and Rameau's writings implied that his use of these chromatic keys relied on their inherent dissonance (by connection, a result of the ordinaire) to fully convey the flavor of his expression. In this sense, some of the expressive key-color would have been lost had Rameau been writing for a temperament more regular than the ordinaire, such as the contemporary Werckmeister, Vallotti, and Kirnberger alternatives.

John Gillespie, *Five Centuries of Keyboard Music* (Belmont: Wadsworth Publishing Company, 1965), 96-98.

⁵⁰ Of note is the fact that the note D# only exists in standard ¼ s.c. meantone or Mersenne's temperament as an enharmonic Eb that would not render an acceptable B major triad. This further shows that by the time of d'Anglebert's prominence at the end of the seventeenth century, the temperament of French vogue had progressed to some degree of circularity.

⁵¹ David Ledbetter and C. David Harris, "D'Anglebert, Jean Henry." *Grove Music Online, Oxford Music Online*. Oxford University Press, accessed April 5, 2016, <http://www.oxfordmusiconline.com.ezproxy.usd.edu/subscriber/article/grove/music/07165>.

downward through a series of chords, used in a sense as a way to obscure the abrupt stability shift from the relative V of G major back to the V of E minor.⁵²

The keyboard works of Francois Couperin were among the highest-regarded in French history. Like other French composers, Couperin utilized the intrinsic gravity of the *ordinaire* to center his works on the most-stable diatonic keys, using the chromatic keys only when their character suited the affectual intent of his composition.⁵³ He was more harmonically daring than other French composers (still a far cry less so than the Germans and Italians of the time), employing numerous chromatic melodic and harmonic movements. These tonal deviations however, followed the same general hierarchy of the *ordinaire*, using the chromatic or shifted tonalities as methods of conveying qualitative affect and variation. One of the best known of Francois Couperin's works, "Les Barricades Mistérieuses," demonstrates his exploration of the stability of the *ordinaire* by transitioning in the third couplet through a diatonic circle-of-fifths progression that linked the nearly-just F major tonality back to the original tonic Bb.⁵⁴ Similar affectual movements that epitomize the key-color variation of the *ordinaire* are scattered throughout his *L'art de toucher le clavecin*, including the Prelude in A major, the Sarabande "Le Prude" in D minor, and the Courante in D major.⁵⁵

These are only a few representative examples, but the same trends and qualities can be found throughout the French harpsichord repertoire from roughly 1650–1750. Despite their differences in individual style, content, and purpose, the works of the influential French

⁵² Camille Saint-Saens, *Pieces de Clavecin de Rameau* (Paris: A Durand et Fils, 1895), 43.

⁵³ Mark Lindley, "Innovations in Temperament," 412–413.

⁵⁴ Francois Couperin, *Second Livre de pieces de Clavecin* (Paris: Le Sieur Boivin, 1745), 13.

⁵⁵ Mark Lindley, "Innovations in Temperament," 415–19.

composers of harpsichord music adhered readily to the characteristics imposed by the meantone-based irregularity of the *tempérament ordinaire*.

Originating in an environment that otherwise established circularity through a Pythagorean approach, the French *tempérament ordinaire* was easily the most unique popular temperament to arise in the late baroque. Its unique ability to retain the sonorous quality of $\frac{1}{4}$ s.c. meantone in the most-used diatonic keys, and the necessary compromises in the chromatic keys to attain circularity, resulted in a very irregular, yet fully circular temperament unlike anything else conceived, or used, at the time. When partnered with appropriate instruments and repertoire, the incongruous aesthetic brought on by drifting in and out of the central diatonic keys with meantone thirds and fifths remains undeniably intriguing, especially in the harmonically adventurous and contrast-rich music of the last decades of the baroque period. The variant harmonic qualities of the *ordinaire*, coupled with the aesthetic preferences of the French baroque composers and harpsichordists, facilitated a body of keyboard work unlike anything else heard in Europe through the baroque period. Altogether, these distinctive elements make the *tempérament ordinaire* a key component in approaching the French baroque literature, and an important episode in the history of Western music.

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